# FORESKINS AS SKIN GRAFTS*

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OF THE methods now used to cover over large denuded areas, none is simpler than the use of circumcised prepuces. In any hospital having an active maternity service, one may obtain all the foreskins necessary. These are usually discarded, however, if desired as grafts, and if not required immediately, they may be kept in physiologic saline solution in a refrigerator, or may be imbedded in ice cubes. It is possible to keep such foreskins for several days and successful results have been obtained with prepuces that have been kept in the ice box in saline or ice cubes for as long as two weeks.

Although it is generally conceded that autografts are more satisfactory, isografts, such as foreskins, succeed in so large a percentage of cases that they are well worth employing, as excellent results may be obtained. There is much difference of opinion as to the usefulness of isografts. McWilliams[1] states that he had never had any success with isografts and "that reports of success with this type of graft may be relegated to mythology." Our experience with the use of prepuces definitely refutes his contention for about two-thirds of the foreskins transplanted "took" satisfactorily. Nevertheless the vast preponderance of opinion at present is that permanently successful results are never obtained with isografts. In most of the cases reported in the literature, the grafts "took"; that is, they adhered and remained in place for a variable number of weeks but ultimately became detached and sloughed off.

It has been suggested by those who have obtained satisfactory "takes" with isografts that when the blood of the donors and recipient shows isoagglutination, favorable results are obtained. Neuhof,[2] Shawan[3] and others report successful grafts when the donors of the grafts were selected on the basis of blood compatibility. On the other hand, there are others who insist that skin grafting between two persons is never successful even when the donors selected cross match with the recipient, except possibly if the skin is grafted from one identical twin to the other. That the blood groups may play a part in the success of isografts is probable when we realize that group specific substances are present in practically every tissue of the body. However, they are not the sole deciding factor. It is known that skin near mucocutaneous junctions grows well and heals well. Kubanyi[4] has demonstrated from his experimental and clinical work that isoplastic transplants "take" better when infant or embryonal tissues were used. McNealy in discussing a paper by Padgett,[5] in which homografts were declared to be

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impractical and always doomed to failure, cited a case that had come under his care, which had been treated previously elsewhere, of a man who had been badly burned. After granulation had occurred, skin grafting was begun. The first grafts were made of prepuces from recently circumcised children. These grafts grew well. After four or five such grafts had been applied, the previous surgeon decided that it would be too tedious to wait for enough material, and decided to use transplants taken from a nephew. One week after employing these new grafts the patient was again transferred to Doctor McNealy's care, and two weeks after the transplantation of the skin of the nephew, the patient developed a typical allergic reaction. Locally the grafted area became hyperemic and swollen and after a few days those grafts which had been taken from the nephew began to separate and gradually melted away. Curiously enough, the foreskin grafts continued to grow vigorously. However, all subsequent grafts were taken from the patient himself. This is the only reference found in the literature of foreskins used as homografts. There are several reports describing their use as autografts, the most recent of which is the case reported by Dr. Jacob Sarnoff[6] of a young boy who had caught a ring on his fourth finger on one of the spikes of a fence. The weight of his body tore off the ring with the skin of his finger, together with the nail. The boy was circumcised and the foreskin grafted over the raw surface of the finger.

TECHNIC.—Our method for grafting the foreskins is quite simple. In view of the prevailing conflicting opinions as to the value of blood group compatibility between the donor and the recipient, neither the patient nor the infants were "typed." All the foreskins that were available were used. If the prepuces could not be used immediately after circumcision, they were put into normal saline solution and kept in a refrigerator until they could be used. About 90 per cent of the foreskins that we transplanted were preserved in this manner before they were used. Grafting was not attempted until healthy, firm granulations were present. At the time the transplanting was actually done, warm saline solution was poured into the jar holding the chilled foreskins to gradually raise their temperature, the excess solution being poured off and more warm saline added until the prepuces approximately reached body temperature. The mucosa was dissected from the skin and discarded, because it was destroyed in the dissection of the preserved specimens. Using the fresh foreskin, the mucosa is not destroyed in the dissection, and can be used as well as the skin. The skin was then placed in warm physiologic saline while the denuded area was prepared for the transplant. The granulations were cleansed with normal saline only. Exuberant granulations were either curetted or removed with curved scissors or a sharp knife. Bleeding was controlled by pressure with gauze before the foreskins were applied. It is quite important to completely stop all bleeding, for collection of blood beneath a graft will cause it to die. This becomes apparent when one remembers that a graft is parasitic and must exist upon

absorption of tissue juices or lymph during its first two or three days of existence. Hence its intercellular spaces must be open to the circulation of lymph in order that nourishment may be carried to its cellular elements. Whole blood cannot accomplish this requirement and hence, any collection of blood beneath a graft is to be guarded against. After the bleeding was completely controlled, the prepared foreskins were placed with their raw surfaces upon the granulating surface at short intervals and then covered with a strip of porowax large enough to cover over the denuded area. Sterile dressings were placed over the porowax. The dressings were not disturbed for four or five days, when the grafts were examined. Using this simple method, in the cases herein reported, approximately 19 out of a total of 27 foreskins, in one case, and two out of four in the other case, "took" satisfactorily. They grew well and fused with one another and with the edge of the denuded areas.

There are innumerable indications for skin grafting and foreskins could be used in practically all of them to cover over the raw areas. Not only can they be used where thin skin is required, but also where thick skin has been destroyed, *e.g.,* on the sole of the foot, as in the case here reported, for the general tendency is for any graft to take on the characteristics of the skin in its new location. Thus the skin of the graft eventually becomes more like that of the skin surrounding the denuded area, thin skin becoming thicker and thick skin becoming thinner. Skin grafting finds its greatest usefulness in cases where the skin has been destroyed by some traumatism or by severe burns. Grafts might be used for chronic ulcers and to cover over amputation stumps. Using foreskins for the grafts should be well worth trying in such cases. Prepuces should make excellent grafts for plastic work on the eyelids.

## CASE REPORTS

**Case 1.**—No. 36-362, Wyckoff Heights Hospital. A boy, age seven, was admitted January 31, 1936. His right foot had been run over by a train. There was complete avulsion of the skin of the plantar surface of the foot, the back of the heel and from the sides of the foot below the internal and external malleoli, exposing muscles, tendons and blood vessels. Roentgenologic examination showed a fracture of the second and third metatarsals; fracture of the second phalanx of the great toe; fracture of the first and third phalanx of the second toe; and dislocation of the third, fourth and fifth toes. The skin that remained on the foot soon became gangrenous and sloughed. With the slough was separated the distal fragment of the second phalanx of the great toe, the second toe beyond the fracture in the first phalanx and the third, fourth and fifth toes. Wet dressings of saline were used until all the infection had been controlled and granulations had formed. Grafting with the foreskins was begun March 15 (six weeks after admission). On that day three foreskins were employed that had been imbedded in ice cubes. Of these, one "took." The foreskins subsequently used were preserved in physiologic saline in the ice box except for two that were used fresh. On March 19, four foreskins were used. Of these, three "took." On March 24, four were used, two "took." On March 31, three were used, three "took." On April 7, three were used, two "took." On April 11, three were used, two "took," and on May 9, three were used, and three "took." While the foreskins were being transplanted, the big toe began to turn inward so that the bottom of the foot looked like the letter C. When

the grafts seemed firmly attached, a splint was placed at the outer side of the foot and bandaged to the foot in an attempt to straighten it. This was partially accomplished, but the pressure of the splint produced two necrotic areas about one-half inch in diameter, which required four weeks to heal. The remaining time that the boy was in the hospital was devoted to limbering up the foot and reeducating him to walk. At present the foot is entirely covered by apparently healthy skin. The boy walks quite well considering the loss of the three lateral toes and parts of the two medial toes. He uses an ordinary shoe.

**Case 2.**—No. 36-3693, Wyckoff Heights Hospital. A girl, age 14, was admitted with oblique fractures of the radius and ulna of the left forearm. These were reduced and traction maintained by using a metal splint. Pressure necrosis of the skin occurred at the base of the middle finger of the hand. When the ulcer healed, the finger became markedly flexed and could not be extended. The scar tissue was excised and the finger kept in extension with a splint. Foreskins were used to cover over the denuded area. The first two that were used did not "take," but the two that were used subsequently "took" satisfactorily.

We do not dispute the superiority of autografts over isografts. Nevertheless our experience with the use of prepuces has convinced us that they are well worth using. The fact that the technic is simple and requires no elaborate preparation should make this type of skin grafting a method of choice. When foreskins are used the patient is not left with scars in other parts of his body. Anesthesia can usually be dispensed with for there is comparatively little pain associated with the curettement of exuberant granulations. Practically all of the operative procedures in these cases were accomplished in the ward. The objection might be raised that not enough foreskins may be available at all times. This is quite true. However, if the supply at the hospital is insufficient, arrangements may be made with other hospitals.

Although all our failures were from preserved foreskins, it is very likely that if we had used more fresh prepuces (we used only two) we would have had failures with them, too. Nevertheless we suggest that all foreskins available be saved and not discarded, but be imbedded in ice cubes or in saline for future use. The ice cubes should be thawed out slowly when the foreskins are to be used. To avoid any possibility of syphilitic infection, it would be wise to carefully investigate the donors, although it is not very likely that the spirochaete will survive when the foreskins are preserved.

Our experience with the foreskins has suggested the possibility of successfully using bone and cartilage transplants obtained from stillborn infants of healthy parents, on the theory that such tissues are so rapidly growing as to afford a greater possibility of success.

NOTE.—This study was made at the suggestion of Dr. Russell S. Fowler, Surgeon in Chief of the Wyckoff Heights Hospital, Brooklyn, N. Y., and the work was done under his supervision at the hospital. The foreskins used were obtained from infants circumcised when they were seven to ten days old.

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